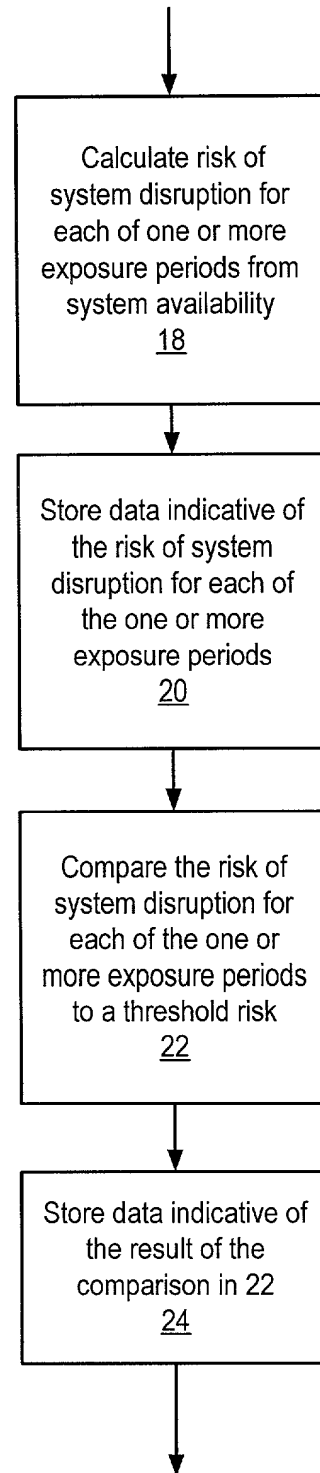
**FIG. 1****FIG. 1A**

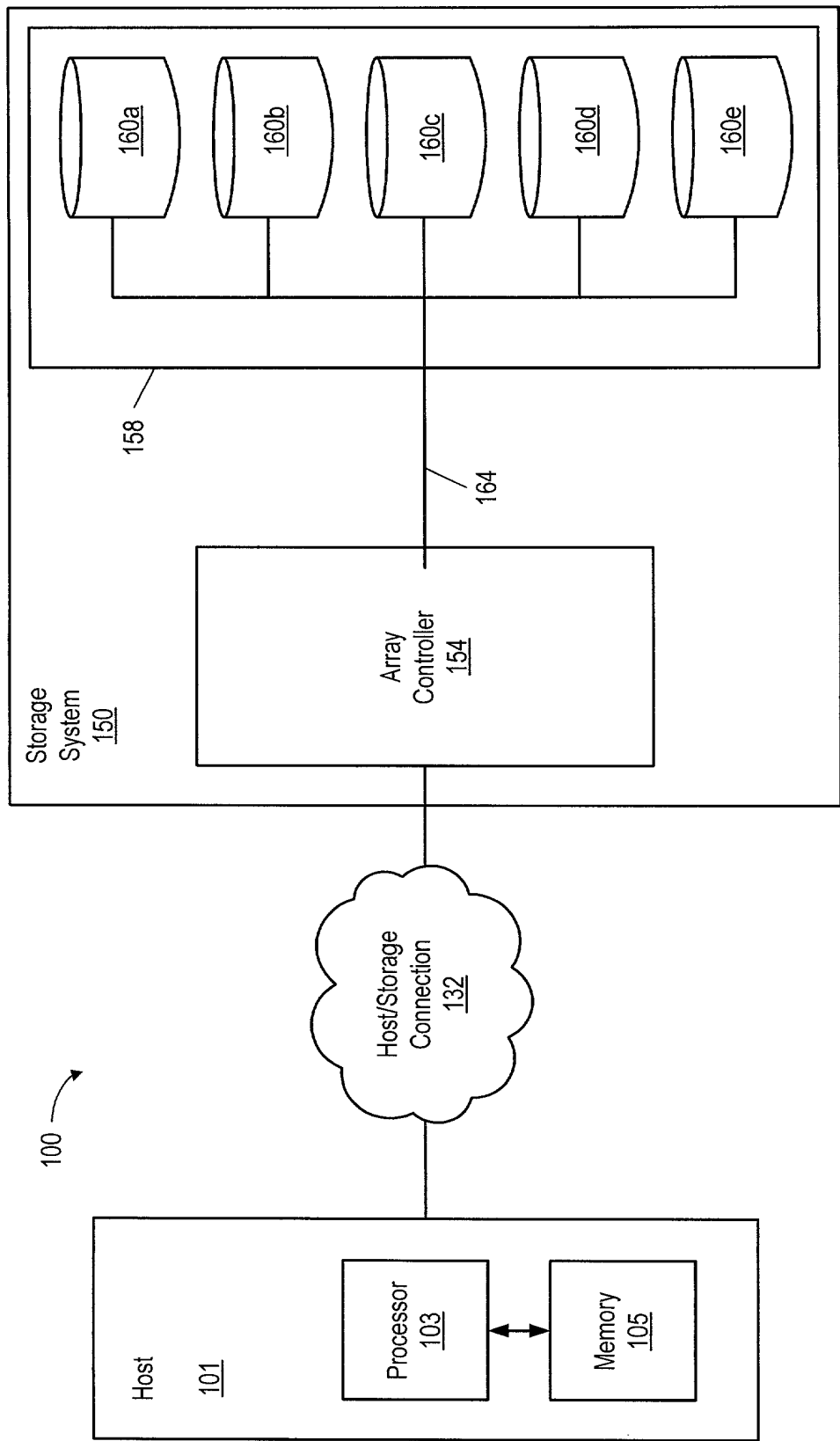


FIG. 2

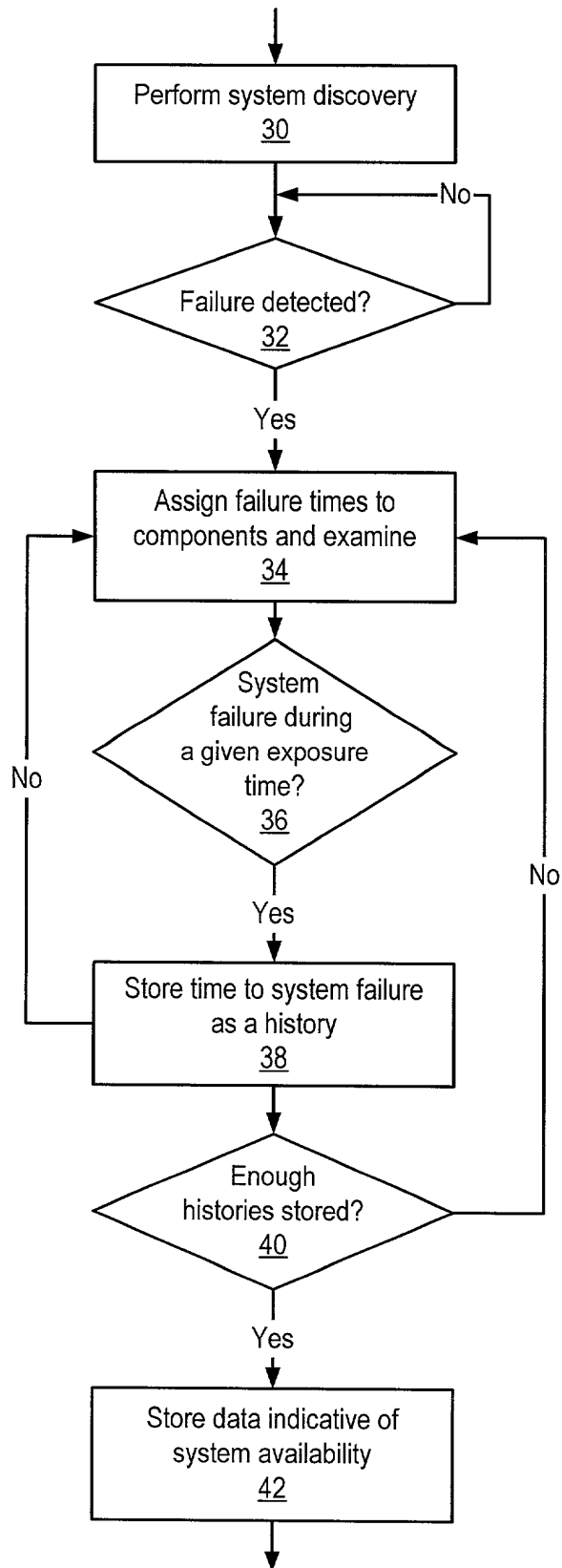
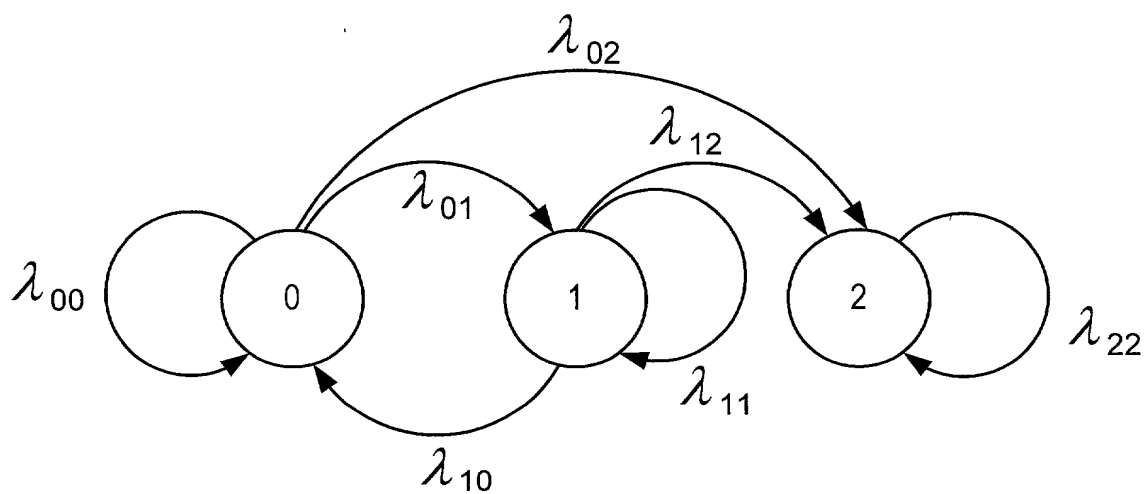


FIG. 3

**FIG. 4A**

$$P_{3 \times 3} = \begin{vmatrix} \lambda_{00} & \lambda_{01} & \lambda_{01} \\ \lambda_{10} & \lambda_{11} & \lambda_{12} \\ \lambda_{20} & \lambda_{21} & \lambda_{22} \end{vmatrix}$$

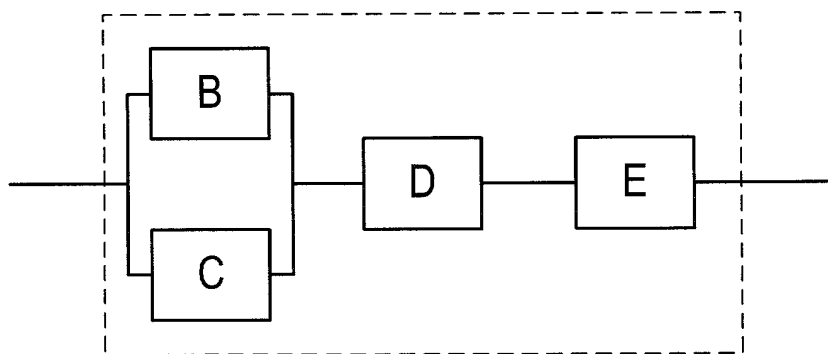
FIG. 4B

$$E_0 = \frac{1 - \lambda_{11} + \lambda_{01}}{(1 - \lambda_{00})(1 - \lambda_{11}) - \lambda_{01}\lambda_{10}}$$

FIG. 4C

$$E_0 = \frac{E_0}{E_0 + \text{MDT}}$$

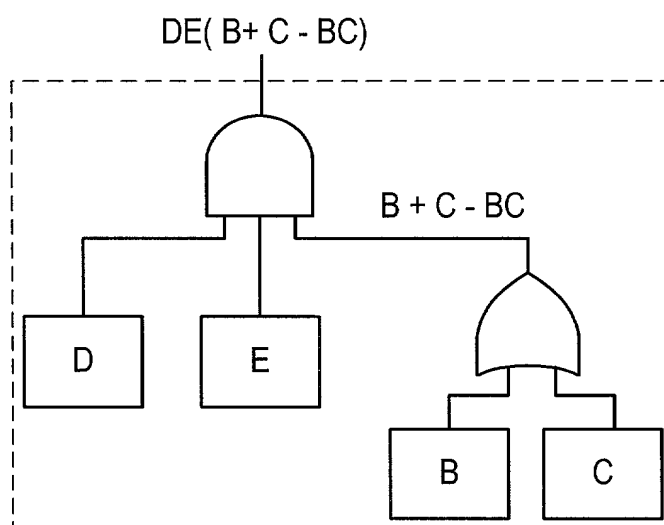
FIG. 4D

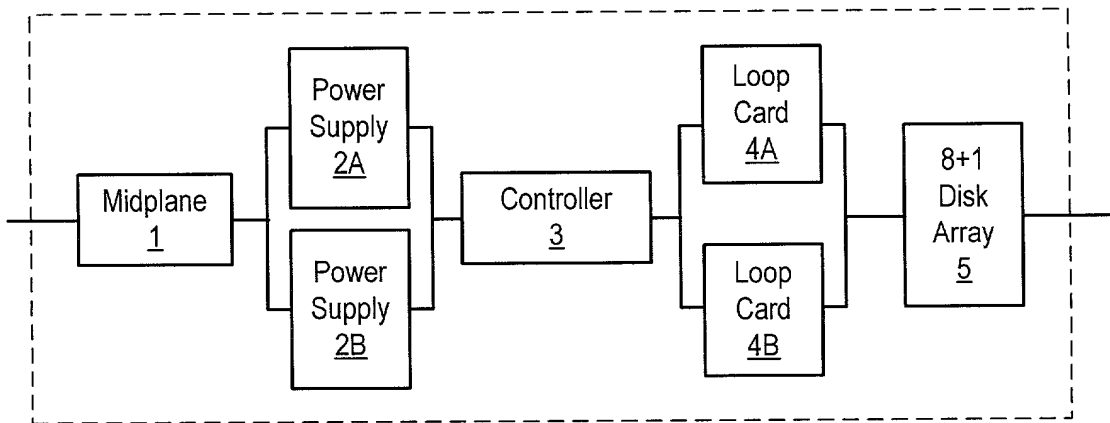
**FIG. 5A**

$$A_s = \prod_{i=1}^N A_i$$

FIG. 5B

$$A_s = \sum_{i=K}^N \frac{N!}{i!(N-i)!} \cdot A_i (1 - A_i)^{N-1}$$

FIG. 5C**FIG. 5D**

**FIG. 6A**

Field Replaceable Unit	Failure Rate per 10 ⁶ hours	Quantity	# Failures to disrupt system
Midplane	10.0000	1	1
Power Supply	33.0000	2	2
Controller	18.0000	1	1
Loop Card	2.0000	2	2
Disk Drive	20.0000	9	2

FIG. 6B

$$A = \frac{1}{1 + (\text{failure rate} * \text{MTTR})}$$

FIG. 6C

$$A_{\text{midplane}} = \frac{1}{1 + (10 \times 10^{-6} * 0.5)} = 0.99999500$$

FIG. 6D

Field Replaceable Unit	Unit Availability
Midplane	0.99999500
Power Supply	0.99998350
Controller	0.99999100
Loop Card	0.99999900
Disk Drive	0.99999000

FIG. 6E

$$A_2 = \sum_{i=1}^2 \frac{2!}{i!(2-i)!} \cdot (0.99998350)^i (1-0.99998350)^{2-i} = 1.00000000$$

FIG. 6F

$$A_2 = \sum_{i=1}^1 \frac{1}{1!(1-i)!} \cdot (0.99998350)^1 (1-0.99998350)^1 = 0.9999835$$

FIG. 6G

Unit/Group	Availability		
	After 0 failures	After 1 failure	After 2 failures
Midplane 1	0.99999500	0.00000000	-
Power Supplies 2	1.00000000	0.99998350	0.00000000
Controller 3	0.99999100	0.00000000	-
Loop Cards 4	1.00000000	0.99999900	0.00000000
Disk Array 5	1.00000000	0.99999200	0.00000000

FIG. 6H

$$A_s = 0.999995 * 0.9999835 * 0.999991 * 1.0 * 1.0 = 0.9999695$$

FIG. 6J

Failures	System Availability
Midplane	0.00000000
One Power Supply	0.99996950
Both Power Supplies	0.00000000
Controller	0.00000000
One Loop Card	0.99998500
Both Loop Cards	0.00000000
Single Disk Drive	0.99997800
Two Disk Drives	0.00000000
One Power Supply & One Loop Card	0.99996850
One Power Supply & One Disk Drive	0.99999150
One Loop Card & One Disk Drive	0.99997700
One Power Supply, One Loop Card, & One Disk Drive	0.99998500

FIG. 6K

$$P(f) = 1 - e^{-\lambda t}$$

FIG. 6L

$$\lambda = \frac{1 - A_s}{A_s * MTTR}$$

FIG. 6M

Probability of System Failure During Exposure Time							
Failed Unit(s)	Exposure Time (hours)						
	2	4	6	12	24	168	672
Power Supply	0.0001	0.0002	0.0004	0.0007	0.0015	0.0102	0.0402
Loop Card	0.0001	0.0001	0.0002	0.0004	0.0007	0.0050	0.0200
Disk Drive	0.0001	0.0002	0.0003	0.0005	0.0011	0.0074	0.0291
Power Supply & Loop Card	0.0001	0.0003	0.0004	0.0008	0.0015	0.0105	0.0415
Power Supply & Disk Drive	0.0002	0.0003	0.0005	0.0009	0.0018	0.0129	0.0504
Loop Card & Disk Drive	0.0001	0.0002	0.0003	0.0006	0.0011	0.0077	0.0304
Power Supply, Loop Card, & Disk Drive	0.0002	0.0003	0.0005	0.0009	0.0019	0.0132	0.0517

FIG. 6N

$$\text{Expected Number of Failures} = \lambda * t * \text{population}$$

FIG. 6P

Expected System Failures During Exposure Time per 1000 Systems							
Failed Unit(s)	Exposure Time (hours)						
	2	4	6	12	24	168	672
Power Supply	0.12	0.24	0.37	0.71	1.46	10.24	40.99
Loop Card	0.06	0.12	0.18	0.36	0.72	5.04	20.16
Disk Drive	0.09	0.18	0.26	0.53	1.06	7.39	29.57
Power Supply & Loop Card	0.13	0.25	0.38	0.76	1.51	10.58	43.34
Power Supply & Disk Drive	0.15	0.31	0.46	0.92	1.85	12.94	51.74
Loop Card & Disk Drive	0.09	0.18	0.28	0.55	1.10	7.73	30.91
Power Supply, Loop Card, & Disk Drive	0.16	0.32	0.47	0.95	1.90	13.27	53.09

FIG. 6Q